Express Mail No: EV887983488US

⑲ **Europäisches Patentamt**
European Patent Office
Office européen des brevets

⑪ Publication number: **0 166 432**
A2

⑫ **EUROPEAN PATENT APPLICATION**

㉑ Application number: **85107893.1**

(51) Int. Cl.⁴: **G 06 K 11/06**

㉒ Date of filing: **26.06.85**

㉚ Priority: **26.06.84 JP 130102/84**

㊸ Date of publication of application: **02.01.86**
Bulletin 86/1

(84) Designated Contracting States: **DE FR GB**

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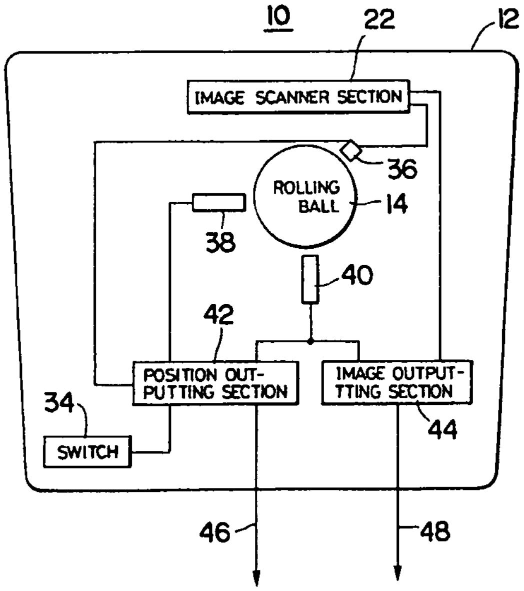
(54) **Position and image data generating unit.**

(57) A position and image data generating unit in which both of a position outputting function (42) and an image outputting function (44) are incorporated in a housing (12) that may be used for supplying position data when the user presses the housing (12) lightly. For supplying an image, the housing (12) is to be pressed harder, and the housing (12) is moved in the direction perpendicular to the scanning direction of an image scanner (22). In both cases, the unit rolls on a ball (14) whose position is scanned. To facilitate the motion, there is provided a guiding roller, whereby in the state in which the housing (12) is depressed, the housing (12) can move in a fixed direction only.

Furthermore, in this state, through the operation of the image scanner (22), the image data are scanned and output in succession in the direction perpendicular to the direction of motion of the housing (12).



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POSITION AND IMAGE DATA GENERATING UNIT

Background of the Invention

Field of the Invention

The present invention relates to a position data generating unit suitable for use in document editing apparatus, such as a Japanese language word processor or a work station.

Description of the Prior Art

In a Japanese language word processor or a work station for office automation, use is being made of a keyboard, a pointing unit, and an image inputting unit, or the like as the inputting unit. As a pointing unit there is available, inter alia, a tablet, a joy stick, or a so-called mouse. Of these, the mouse has recently been attracting special attention for such reasons as its low cost and the simplicity with which the switching operation can be made for holding the mouse from the work on the keyboard. In addition, a facsimile device is being used as the image imputting unit. However, a contact sensor has been developed in recent years for inputting the picture. Here, instead of inputting the image by inserting a piece of paper, as with facsimile, there is being proposed a method of inputting the image by manually moving the contact sensor. In such an image inputting unit with a contact sensor, it is possible to input the image of a portion of a piece of paper even when one side of the paper is bound, as in the case of a book. This leads to such advantages as that it is made possible to input an arbitrary image less expensively than with the facsimile.

Now, in preparing a document at the work station or the like, there occur cases in which both the sentences and figures occur in the document. Accordingly, when image data are desired to be input in the prior art document editing apparatus, an operation is carried out which the position for inputting the figure is designated first by the mouse, and then the image data is input to the contact sensor or the like to be input in the designated area. Because of this, both the position inputting unit such as a mouse, and the image inputting unit, such as a contact sensor, are connected at the work station as separate input terminal equipments. Therefore, in editing a document, a user has to operate the mouse and the contact sensor by hand alternately. In addition to the troublesome nature of the operation and lowering of working efficiency, it gives rise to such problems as narrowing of the available working space caused by the placing of the two separate units on the work station desk.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a position and image data generating unit which makes it possible to improve markedly the efficiency of editing a document that includes pictures.

Another object of the present invention is to provide a position and image date generating unit which makes it possible to use a distance measurer for the image inputting mechanism and the position inputting mechanism in common.

According to the present invention, there is provided a position data generating unit including a housing, a rolling ball that is fixed to the housing via an elastic body, a position detector which detects the position data based on the rolled distance of the rolling ball, a guiding roller which, when the elastic body fixed to the housing is in the compressed state, regulates the direction of rolling of the rolling ball and makes it possible to move the housing in a fixed direction, and an image scanner which reads the image when the elastic body fixed to the housing is in compressed state, and inputting of the image is carried out by bringing the elastic body to compressed state by pressing hard on the housing , to scan the image data in succession in the direction perpendicular to the direction of the motion of the housing , by the action of the image scanner.

BRIEF DESCRIPTION OF THE DRAWING

These and other objects, features and advantages of the present invention will be more apparent from the following description of a preferred embodiment, taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a bottom view of a position and image inputting unit embodying the present invention;

Fig. 2 is a simplified cross-sectional view of the position and image inputting unit as shown in Fiug. 1;

Fig. 3 is a simplified circuit diagram of the position and image inputting unit as shown in Fig. 1;

Fig. 4 is a block circuit diagram of the position and image inputting unit as shown in Fig. 1; and

Fig. 5a - f are time charts showing operation of the circuit as shown in Fig. 4.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Fig. 1, a position and image data generating unit embodying the present invention is shown with a reference numeral 10. The position and image data generating unit 10 has a rolling ball 14 in a housing 12, and includes further auxiliary balls 16, 18, and 20 for supporting the rolling ball 14, to add the image inputting function, an image scanner 22 for inputting the image data, and a guiding roller 24 for regulating the moving direction of the housing to keep the housing 12 moving in a fixed direction for all times during the operation of the image scanner 22. Figure 2 is a simplified cross-sectional view of the position and image outputting unit 10 which illustrates the locations of the various components described in the above and the height relationships of the various components with respect to the desk surface 32. As seen from Fig. 2, the rolling ball 14 and the auxiliary balls 18 and 20 are fixed to the housing 12 via freely expansible springs 26, 28, and 30, respectively. (It should be noted, though not shown in the figure, the auxiliary ball 16 is also fixed to the housing 12 via a spring.) Normally, the position and image outputting unit 10 has the rolling ball 14 and the auxiliary balls 16, 18, and 20 in contact with the desk surface 32. Accordingly, as long as the user presses the position and image outputting unit lightly to the desk surface 32, it moves on the desk surface 32 due to rolling of only the rolling ball 14 and the auxiliary balls 16, 18, and 20 that make contact with the desk surface 32. When the user operates a switch 34 at a desired position, it becomes possible to read the position data (the operation of the position output function will be described later). Next, for inputting the image, the user presses the position and image inputting unit hard toward the desk surface 32 (pressed in the direction of the arrow in Fig. 2). Then, the springs 26, 28, and 30 are compressed to let the rolling ball 14 and the auxiliary balls 16, 18, and 20 enter toward the inside of the housing 12. Because of this, the guiding roller 24 touches the desk surface 32 together with the rolling ball 14 and the auxiliary balls 16, 18, and 20. The guiding roller 24 has a cylindrical form, with its long axis parallel to the scanning direction of the image scanner 22, as shown by Fig. 1. Therefore, when the position output unit is pressed hard, the direction of motion of the unit is regulated to be only the direction which is perpendicular to the direction of the long axis of the guiding roller 24 (that is, the scanning direction of the image scanner 22). At the same time, by the hard press on the housing 12, a switch 36 is turned on due to compression of the spring 26, which actuates the image scanner 22. In this manner, the image is scanned in succession one line at a time in the direction perpendicular to the direction of motion of the housing 12, accomplishing inputting of the image which is on the desk surface 32. In the present embodiment, when the springs 26, 28, and 30 are in normal state, the guiding roller 24 is arranged to be fixed to the housing 12 with separation of a fixed height from the common contact line with the rolling ball 24 and the auxiliary balls 16, 18, and 20, namely, the desk surface 32, so that the user can select the position inputting function or the image inputting function in accordance with the distribution of his force that is exerted on the packing case 12. The operation of the unit as an image inputting unit will also be described later.

Referring to Fig. 3 the circuit construction of the position and image inputting unit 10 embodying the present invention is illustrated.

The circuit construction of the position and image inputting unit 10 includes rotary encoders 38 and 40 which measure the rolled distance in the X and Y directions, respectively, of the rolling ball 14 that rolls on the desk surface 32, a position outputting section 42 which outputs the total displacement of the unit 10 computed based on the pulse numbers input from the rotary encoders 38 and 40, and an image outputting section 44 which outputs the image data that corresponds to the pulse signals from the rotary encoder 40 for the Y direction by receiving an image data from the image scanner 22 and the pulse signals from the rotary encoder 40. The position output section 42 is arranged to interrupt its operation by the signal for turning the switch 36 on, due to the hard press applied to the housing 12.

Next, the operation of the embodiment will be described by referring to Fig. 3. When the position and image inputting unit is used as a position inputting unit, that is, when the housing is moved while pressed lightly, the rolling ball 14 rolls on the desk surface, similar to an ordinary mouse, and the rolled distance in the X and Y direction are measured by the rotary encoders (distance measurers) 38 and 40 for the X and Y directions, respectively, the results of the measurements being input to the position outputting section 42. Here, as the rolling ball rolls, every time when the surface of the ball crosses the rotary encoder by a fixed distance, each rotary encoder generates a pulse. The position outputting section 42 computes the total amount of shift based on the pulse numbers that it receives from the rotary encoders 38 and 40 for the X and Y directions, respectively. If the user turns on the switch 34, the position outputting section 42 outputs the position data (position coordinates) of the total amount of shift through a signal line 46. For example, if the user shifts the position inputting unit on the desk surface while watching the display which is not shown in the figure, a curser moves according to the shift, and when the switch 34 is turned on at a desired position, the position coordinates for that time are arranged to be output.

Next, when the position and image data generating unit is used as an image inputting unit by a hard press on the housing by the user, the supporting spring 26 of the rolling ball 14 is compressed (of course, the auxiliary balls 16, 18, and 20, too, are depressed). By this action the image switch 36 is turned on and the image scanner section 22 is actuated. In this way, the image data for one line is input from the image scanner section 22 and is transferred to the image outputting section 44. To the image outputting section 44 there is input also the pulse signal from the rotary encoder 40 for the Y direction. Corresponding to the input pulse signal, the image inputting section 44 outputs the image data through the signal line 48. That is, the scanning direction of the image scanner 22 is perpendicular to the direction of distance measurement of the rotary encoder 40 (the direction of motion of the housing 12 is regulated to be perpendicular to the scanning direction due to the presence of the guiding roller 24), so that for every shift for a fixed distance of the image scanner 22, the image data input in the unit of one line will be output through the signal line 48.

(Actually, with an input of the image data at an interval of eight scans per millimeter, for example, eight pulse signals are output from the rotary encoder 40 during a shift of one millimeter of the rolling ball 14. Therefore, the timing of the image data output from the image outputting section 44 is one line corresponding to one pulse signal.) As in Fig. 3, the operation of the position outputting section 42 is interrupted by means of the signal for turning on the switch 36 induced by a hard press on the housing 12, the unit will be made to function only as an image data reading unit. Moreover, the position outputting section 42, the image outputting section 44, and the switch 34 may be placed on the outside the housing 12, and also it may be arranged to have the image data and the measured distance alone output from the housing 12.

Next, the image scanner 22 will be described by referring to Figs. 4 and 5.

As shown by Fig. 4, the image scanner section 22 includes a line sensor 50 and a timing generator 52. The timing generator 52 is actuated by the signal of the image switch 36 as shown in Fig. 5a to generate a clock pulse and a start pulse as shown by Figs. 5b and 5c, respectively. These pulse are transmitted to the line sensor 50 and the image outputting section 44 through a clock pulse line 56 and a start pulse line 58.

The line sensor 50 is actuated by the start pulse, and by a pulse which is input thereafter, one line of image data detected by the line sensor 50 as shown by Fig. 5e is transmitted to the image outputting section 44 as a series, for each clock, via a data 1 line 60. The start pulses are generated at a rate of one pulse per clock numbers that are necessary for scanning one line of the line sensor 50. The detected image data output from the line sensor 50 are transmitted in succession through the data 1 line 60, in which the pulse that indicates the starting position of one line is the start pulse therefore, the image outputting section receives first a rotary encoder pulse as shown by Fig. 5d, and then at the first start pulse that is input thereafter, outputs the image data that is transferred from the line sensor 50 to the outside through a data 2 line 62. Here, the data that is output to the outside lasts until the next start pulse appears. In other words, the data between the first start pulse and the second start pulse subsequent to the generation of a rotary encoder pulse, is output to the outside as one line of image data, as shown in Fig. 5f.

It should be noted that the present invention is not limited to the embodiment described in the foregoing. Thus, for example, the switch for inputting the image may be installed at the top of the position inputting unit, and the user controls the turning on and off of the switch. Or, a mechanism may be introduced which regulates the direction of rolling of the rolling ball 14 during the inputting of the image to a fixed direction only. Furthermore, an optical mouse may be used for the position inputting unit. Here, what is meant by an optical mouse is a mouse whose distance of displacement is computed by means of a mechanism which detects the numbers of crossing in the X and Y directions of the lattice points, by introducing beforehand a lattice-like pattern on the desk surface. Needless to say, the present invention includes the case in which such an optical mouse is utilized as the position inputting unit.

Various modifications will become possible for those skilled in the art after receiving the teaching of the present disclosure without departing from the scope thereof.

Claims:

1. A position and image data generating unit which has a position data generating function and a function to input the image information from an object to be detected, characterized by:

a housing (12);

position outputting means (42) installed in said housing (12) for providing data representing the position of said housing (12);

image reading means (22) installed on said housing (12) for reading image information; and

switching means (36) for switching the operation between said position outputting means (42) and said image reading means (22) in said housing (12).

2. A position and image data generating unit as claimed in Claim 1, in which said switching means (36) carries out control to have either one of said position outputting means (42) and said image reading means (22) to be operated.

3. A position and image data generating unit as claimed in Claim 2, in which said position outputting means includes a rolling ball (14) which makes contact with the surface (32) of the object, and means (36) for providing position data for said housing (12) based on the rolled distance of the rolling ball (14).

4. A position and image data generating unit as claimed in Claim 3, further comprising:

guiding means (24) for regulating the direction of rolling of the rolling ball (14) to make it possible to move said housing (12) in a fixed direction when said image reading unit (22) is in operation.

5. A position and image data generating unit as claimed in Claim 4, in which said switching means comprises an elastic part (26) which is disposed between said rolling ball (14) and said housing (12) and a first switch (36) which outputs a signal, when the elastic part (26) is compressed by a predetermined amount of displacement, to actuate said image reading means (22) as well as to interrupt the operation of said position ouputting means (42).

6. A position and image data generating unit as claimed in Claim 4, in which said switching means comprises an elastic part (26) which is inserted between said rolling ball (14) and said housing (12) and a first switch (36) which outputs a signal that actuates said image reading means (22) when the elastic part (26) is compressed by a predetermined amount of displacement.

7. A position and image data generating unit as claimed in Claim 5 or 6 in which said guiding means comprises a guiding roller (24) arranged in said housing for bringing, when the elastic part (26) is compressed by a predetermined amount of displacement, said housing (12) to make contact with the surface of the object in order to make said housing (12) movable in a fixed direction.

8. A position and image data generating unit as claimed in Claim 5, in which said position outputting means further comprises rotary encoders (38,40) for measuring the rolled distances in the X and Y directions of the rolling ball (14) which rolls on the surface of the object, a position output section (42) for computing the total amount of displacement of said housing (22) from the numbers of pulses output by the rotary encoders (38,40) and a second switch (34) for causing output of the total amount of displacement of said housing computed at the position output section (42).

9. A position and image data generating unit as claimed in Claim 8, in which said image reading means comprises an image scanner (22) for reading the image information, and an image outputting section (44) for outputting image data corresponding to a pulse signal, by receiving the image from the image scanner (22) and the pulse signal from the rotary encoder (40) for the Y direction.

10. A position and image data generating unit as claimed in Claim 9, in which the first switch (36) is arranged, when the elastic part (26) is compressed by a predetermined amount of displacement, to be turned on to start the operations of the image scanner (22) and the image output section (44) as well as to interrupt the operation of the position outputting section (42).

11. A position and image data generating unit as claimed in Claim 4., in which said switching means comprises a switch (36) for switching between operation and interruption of operation of said image reading means (22).

12. A position and image data generating unit as claimed in Claim 2, in which said position outputting means (42) is arranged for use with a lattice-like pattern provided beforehand on a surface, and comprises means for detecting how many of the lattice points are crossed in the X and Y directions.

13. A position and image data generating unit as claimed in Claim 12, in which said switching means (36) comprises a switch for switching between operation and interruption of operation of said image reading means (22).

14. A position and image data generating unit which has a position inputting function and a function for receiving image information from an object to be detected characterized by:

a housing (12);

position outputting means which includes a rolling ball (14) that makes contact with the surface of the object to be detected, for outputting the position data of said housing (12) based on the rolled distance of the rolling ball (14);

an elastic part (26) which is inserted between said rolling ball (14) and said housing (12);

an image scanner (22) for reading the image information;

an image outputting section (44) which receives the image data from the image scanner (22) for outputting image data in accordance with distance moved in the direction of motion of the scanner;

a guiding roller (24) arranged in said housing (12) which brings, when the elastic part (26) is compressed by a predetermined amount of displacement, said housing (12) into a position to make contact with the surface of the object to be detected in order to make said housing (12) movable in a fixed direction; and

a first switch (36) arranged to output, when the elastic part (26) is compressed by a predetermined amount of displacement, a signal that causes the image outputting section (44) to start operation as well as to interrupt the operation of the position outputting means (42) that has been in operation.

15. A position and image data generating unit as claimed in Claim 5, in which said position outputting means (42) further comprises rotary encoders (38,40) for measuring the rolled distances in the X and Y direction of the rolling ball (14) which rolls on the surface of the object, a position outputting section (42) for computing

the total amount of displacement of said housing (12) from the numbers of pulses outputted by the rotary encoders (38,40), and a second switch (34) for causing output of the total amount of displacment of said housing (12) as computed at the position output section (42).

FIG. 1

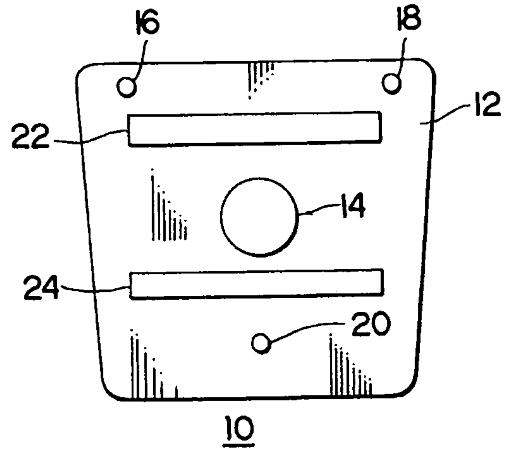

FIG. 2

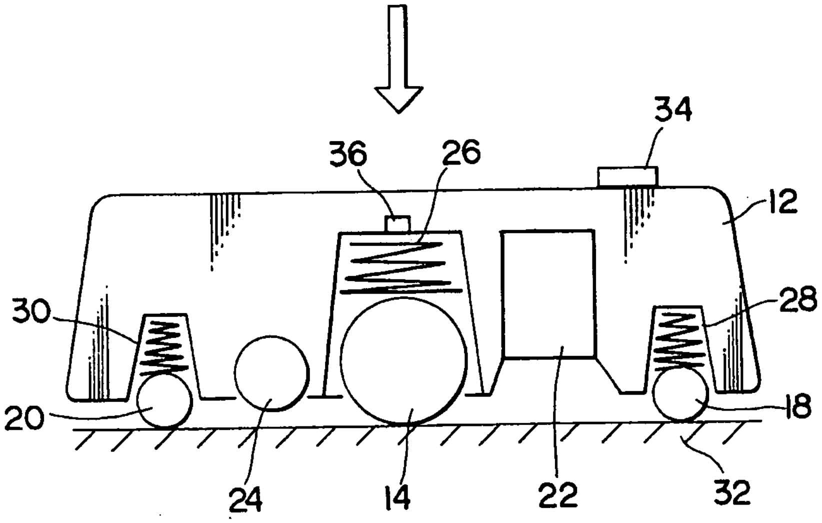

FIG.3

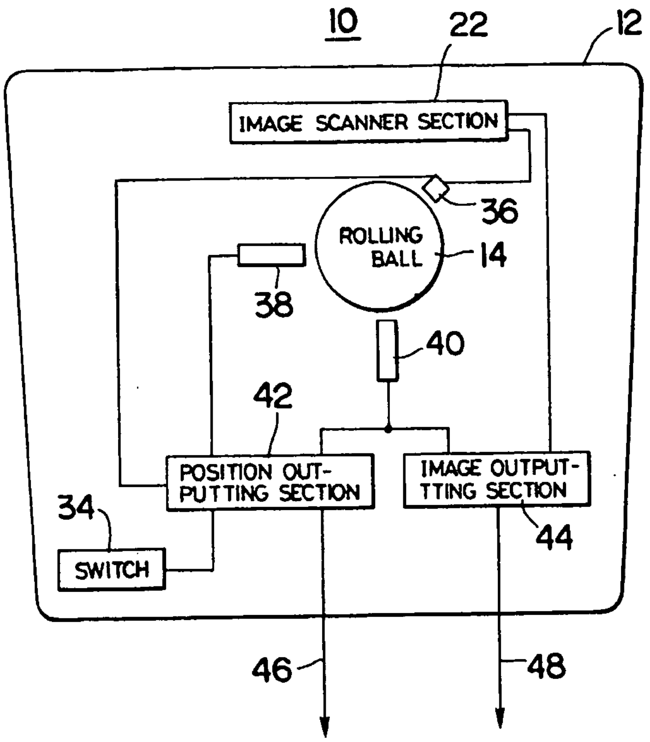
IMAGE SCANNER SECTION
ROLLING BALL
POSITION OUT-PUTTING SECTION
IMAGE OUTPUT-TTING SECTION
SWITCH

FIG.4

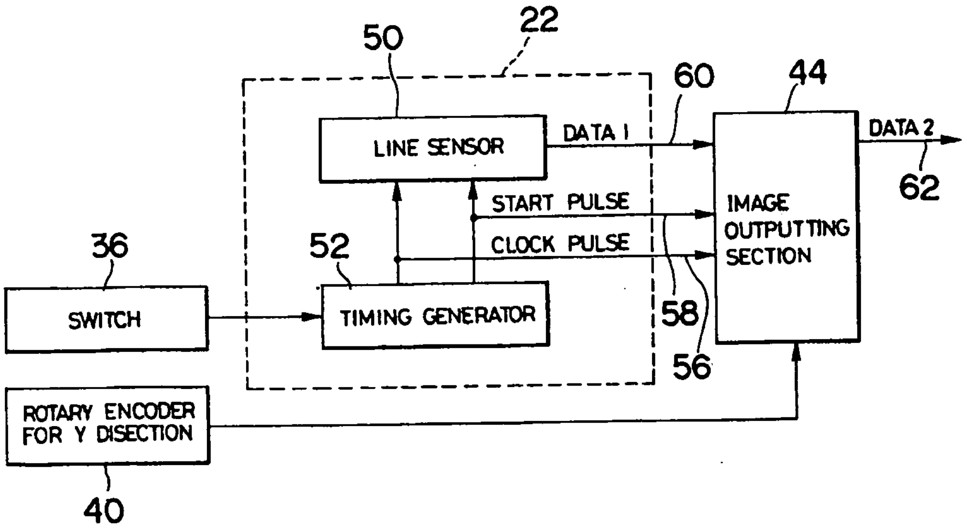
50
22
60
44
LINE SENSOR
DATA 1
DATA 2
62
START PULSE
IMAGE OUTPUTTING SECTION
CLOCK PULSE
36
52
SWITCH
TIMING GENERATOR
58
56
ROTARY ENCODER FOR Y DISECTION
40

FIG.5

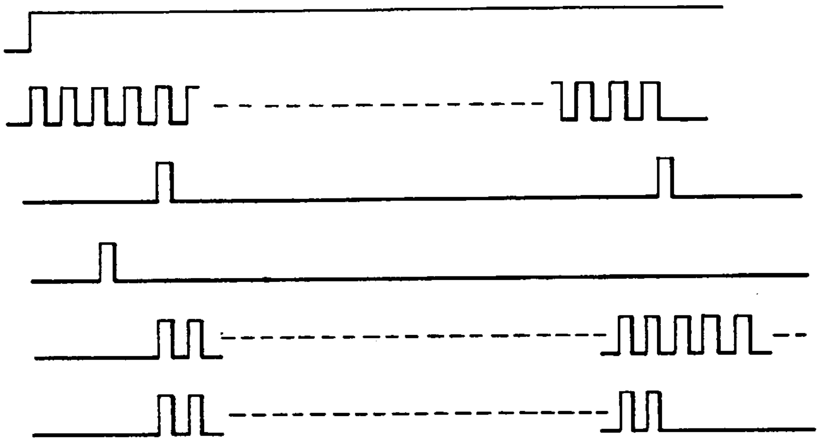

FIG.5a

FIG.5b

FIG.5c

FIG.5d

FIG.5e

FIG.5f